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ERGONOMICS AND WORK SAFETY STUDIES AT ÓBUDAI UNIVERSITY'S OCCUPATIONAL SAFETY AND HEALTH LABORATORY. A SYNTHESIS OF MAIN ACHIEVEMENTS

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Abstract: *This paper presents comprehensive research on occupational safety and health (OSH) practices in Hungary, focusing on advancements in ergonomics, performance measurement, safety culture, and hazard prevention. It explores integrating AI and digital tools to improve workplace safety and prevent injuries. The study covers various industries, including healthcare, manufacturing, and correctional services, offering practical solutions for enhancing leadership commitment to OSH standards. By fostering networking and bringing together diverse capacities, the paper aims to contribute to developing robust OSH practices and improving workplace well-being.*

Keywords: *Occupational safety and health (OSH), Hazard prevention strategies, Digital tools for safety management, Leadership in OSH practices, Workplace injury prevention, OSH strategies in Hungary*

1. INTRODUCTION

The National Occupational Safety and Health Policy 2024-2027 outlines Hungary's occupational safety and health (OSH) priorities from 2024 to 2027, aligning with the European Union's OSH strategy for 2021-2027 [1]. Over the past decades, significant progress has been made in improving workplace health and safety in Hungary, as evidenced by the reduction in fatal workplace accidents from around 150 at the turn of the millennium to half that number [2].

The National Institute for OSH Research, established in 1954, historically shaped Hungarian OSH research. It functioned as the OSH Research Foundation until its dissolution on January 1, 2008. Following this, occupational safety research in Hungary effectively came to a standstill.

At the same time, significant changes happened in occupational health and safety in higher education when universities started to offer OSH degrees earlier under state supervision. In 2010, Óbuda University launched a four-semester, part-time postgraduate program for OSH professionals, which became closely integrated with the university's safety and security engineering programs. This integration provided undergraduate and graduate students with exceptional opportunities for advanced OSH studies.

An important factor in maintaining Hungary's OSH expertise has been the activity of the focal point of EU-OSHA, including professional events and supporting the availability of Hungarian-language publications. Furthermore, including thesis projects as an integral part of university studies has facilitated the adaption and application of international knowledge.

Establishing the Doctoral School of Safety and Security Sciences in 2012 was a landmark development in modern Hungarian OSH research. Since then, the school has offered a platform for OSH-related research.

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Among the nearly 150 doctoral students enrolled, many are engaged in various OSH and ergonomics research projects.

The research conducted under the current laboratory OSH leadership employs a comprehensive approach that integrates both quantitative and qualitative methods. This includes systematic literature reviews to establish a theoretical foundation, followed by empirical research that adheres to rigorously formulated hypotheses.

The methodologies address the multifaceted nature of safety science, encompassing performance measurement, economic impact assessment, and exploring new technologies and methods for enhancing OSH. The research is inherently linked to practical applications, and field studies are also possible because the doctoral students involved in the research are practicing professionals, often with decades of experience as safety managers or in roles responsible for public health development.

The laboratory's research spans several critical areas in safety science:

1. Performance Measurement and Economic Impact: This area focuses on quantifying the effectiveness of OSH-related interventions and their economic implications, aiming to enhance organizational decision-making processes.
2. Safety Culture Elements: This research explores the dynamics of organizational functioning, leadership, communication, and cooperation and their impact on safety culture.
3. New Hazard Prevention: This includes investigating the safety challenges and opportunities of emerging work platforms and digital tools.
4. Application of Advanced Technologies: The lab uses Artificial Intelligence (AI) and other innovative technologies to solve pressing safety issues and to improve workplace health and safety outcomes.
5. Ergonomics and Human Factors: The ergonomic research focuses on reducing workplace risks associated with physical strain and improving the work environment to prevent occupational diseases and injuries.

2. RESEARCH TOPICS

2.1 Anthropometric consideration in hand tool design

The manufacturing sector is trying to reduce the incidence of hand tool-related injuries. An imaginative strategy involving ergonomics, safety regulations, tool design, workplace optimization, and human reliability analysis is needed. The main objectives are improving management processes and preventing hand tool-related illnesses [3].

Designing workstations, tools and equipment to minimize accidents and injuries is a major scientific challenge in balancing ergonomic principles and safety regulations. It is also necessary to develop thorough risk reduction strategies that focus on specific hand tools, classify injuries according to severity and offer practical solutions to reduce the frequency and severity of accidents [4].

Understanding the physiological effects of wrist flexion and extension and excessive muscle effort is essential. These steps are critical to ergonomic management plans that reduce cumulative trauma problems caused by prolonged manual handling. Understanding these physiological effects can help develop tools and practices that protect workers' health [5].

There are three main goals of this research: first, to create scientific strategies and methods for measuring forces during work and to develop efficient workstation tool usage techniques using new technologies; second, to obtain extensive knowledge of the physiological effects of repetitive manual activities on the wrist and muscles in order to prevent potential degradation; and third, to develop strategies and measures to prevent hand tool-related disorders by identifying their causes.

This research is based on five hypotheses. Firstly, H1 proposes that electromyography (EMG) can be used to detect the onset of muscle fatigue during prolonged grasping tasks to prevent injury and cumulative trauma disorders.

According to H2, individual characteristics, task-specific variables and ergonomic considerations can be used to properly identify the risk levels associated with tasks involving non-powered hand tools, leading to targeted risk reduction methods.

According to H3, there may be a relationship between individual characteristics, task-specific variables, ergonomic considerations and the perception of risk when performing tasks with non-powered hand tools. This could lead to hand-related illnesses.

H4 postulates that a machine learning algorithm can accurately identify indicators of muscle fatigue during prolonged or repetitive manual tasks from EMG signals, allowing for targeted treatments to reduce the risk of injury and improve workplace safety.

In the end, H5 suggests that an AI system trained on EMG data could detect signs of muscle fatigue and provide immediate feedback to senior staff, increasing productivity and reducing the risk of injury.

Stage 1 thoroughly reviews the literature and techniques for using electromyography to study hand muscle action. It also thoroughly reviews numerous EMG application techniques across settings and disciplines.

Stage 2 presents a mathematical categorization technique for risk reduction measures and a combined risk detection and assessment method.

This is based on information from ergonomics expert surveys conducted in workplaces where non-powered hand equipment is used. The Analytic Hierarchy Process (AHP) is used to evaluate and rank risk factors to reduce hand injuries systematically.

Stage 3 measures risk perception and risk/benefit analysis about hand tool use using the Domain-Specific Risk-Taking (DOSPERT) questionnaire. Organizations can use this understanding to minimize workplace safety procedures and reduce the number of hand injuries.

The EMG data collection technique used in Stage 4 to identify the onset of muscle fatigue during hand tool use is described. This method facilitates the development of procedures that effectively reduce fatigue, thereby improving worker productivity and safety.

2.2 Psychosocial factors in manual handling

Physical and psychological risk factors affecting the health and well-being of employees are a major focus of ongoing research into modern industrial trends. The main problem identified is the high number of accidents at work, which result in significant loss of working days each year. In this sense, industry must immediately address these risk factors. This has necessitated the improvement of organizational frameworks to prevent future incidents and improve overall workplace safety [6].

OSH is considered in the research design, which addresses both physical and psychological risk factors in the workplace [7]. Integrating ergonomic principles with safety standards will be emphasized, and organizational structures will be improved to prevent occupational accidents.

The study aims to improve worker performance and safety, particularly in manual handling activities to prevent musculoskeletal disorders (MSDs), by looking at cognitive load, psychological demands and physical ergonomics.

The research will use an evidence-based methodology and tools like the NIOSH lifting equation and systematic literature reviews. The design of comprehensive, human-centered safety measures that place workers' physical and mental well-being at the forefront will be facilitated by this addition to the body of knowledge in OSH [8].

The research objectives provide an approach from some perspectives.

First and foremost, it aims to demonstrate the importance of improving comfort in the workplace to prevent and reduce work-related illnesses such as musculoskeletal disorders (MSDs) in situations involving manual handling. This consists of controlling psychosocial variables directly impacting cognitive ergonomics, thereby improving workplace safety and security.

The study's second goal is to determine what is currently known about the neurocognitive

elements of the NIOSH (National Institute for OSH) MSD prevention equation. A comprehensive literature review will identify the neuro-ergonomic parameters and define a safe and healthy work environment from a neurocognitive and psychosocial perspective.

Thirdly, the research will identify cognitive ergonomic risk factors associated with occupational ill health, particularly those directly related to preventing MSDs.

The research is divided into four stages:

- Stage 1 presents a systematic literature review to identify neurocognitive factors in the NIOSH manual handling equation for the prevention of MSDs, provides an overview of how the inclusion of psychosocial stressor distractors affects the correct NIOSH application, identifies key distractors and their influence in ergonomic manual handling positions.
- Stage 2 - The identified neurocognitive and psychosocial factors are categorized according to the worker's perception. The AHP determines this categorization to identify the main distractors and their impact on the tasks.
- Stage 3 - An ergonomic squatting position detection during a manual handling task by applying a lightweight machine learning model to determine the correct squatting technique and prevent injury [9].
- Stage 4 - A laboratory observation experiment will evaluate the influence of neurocognitive and psychosocial factors and how these factors affect manual handling tasks.

2.3 Methodological Issues in Engaging and Preparing Corporate Leaders for Managing Psychosocial Risks

The research addresses the critical challenge of engaging and preparing corporate leaders to effectively manage psychosocial risks within their organizations in alignment with the ISO 45003 standard [10]. Psychosocial risks, including stress, burnout, and workplace harassment, significantly impact employee well-being and organizational efficiency [11].

Despite the importance of these risks, there is often a lack of awareness and commitment among corporate leaders, which hinders the effective implementation of OSH policies [12].

This research is positioned at the intersection of OSH and ergonomics, focusing on how leadership involvement and behavior can influence the management of psychosocial risks and thereby improve workplace safety and culture.

The central research question is: What factors motivate corporate leaders to commit to managing psychosocial risks, and how can they be effectively involved in applying ISO 45003?

The research framework is built around three sub-questions:

- What motivates senior and middle management to engage in managing psychosocial risks?
- What communication and training tools can effectively involve leaders in implementing ISO 45003?
- How can leaders be prepared to integrate psychosocial risk management into workplace safety systems?

The research employs both qualitative and quantitative methods. These include interviews and focus groups with corporate leaders and safety professionals to gain deep insights into their perspectives and experiences with psychosocial risks.

Standardized measurement tools aligned with ISO 45003 and tailored questionnaires will also be used to assess leaders' knowledge and attitudes towards psychosocial risk management. The research also involves case studies of companies that have successfully implemented ISO 45003, focusing on the role of leadership in these processes.

The research aims to develop tools and methods that assist corporate leaders in better understanding and actively supporting the management of psychosocial risks. These tools are expected to improve leaders' commitment to OSH by providing clear guidelines and training programs that align with their organizational roles and responsibilities.

The research outcomes are expected to enhance employee well-being and

organizational performance by fostering a safety culture where psychosocial risks are managed proactively.

Preliminary results from interviews and focus groups have revealed the critical importance of leadership commitment to shaping organizational culture and ensuring compliance with legal requirements related to psychosocial risks.

2.4 Ergonomics Competency Development in Small Enterprises

The project focuses on enhancing ergonomics education and practical training in small enterprises. This initiative aims to improve workplace safety and well-being by addressing the specific needs of small businesses across various countries.

Small enterprises often face significant challenges in implementing effective OSH practices due to limited resources and a lack of specialized knowledge [13]. This project addresses these challenges by developing tailored ergonomic training that is both accessible and applicable, thereby enhancing these workplaces' overall safety and productivity.

The research question is as follows: How can tailored ergonomic training be developed and implemented in small enterprises to enhance workplace safety and well-being? Methodology:

- Needs Analysis: Conducting secondary research and surveys to identify specific ergonomic training needs within small enterprises.
- Curriculum Development: Creating a tailored curriculum based on the identified needs.
- Guidebook Preparation: Develop a comprehensive guidebook that includes the curriculum and practical recommendations for sustainable, ergonomic solutions.
- Workshop Implementation: Organizing on-site workshops and mentoring sessions to apply ergonomic principles practically.

The project expects to produce a tailored Ergonomics Curriculum specifically designed for small enterprises, a Comprehensive Needs Analysis Report and a practical guidebook. The on-site workshops are anticipated to increase ergonomics awareness and foster sustainable, ergonomic solutions within these businesses.

2.5 Enhancing OSH in healthcare settings

The healthcare sector has been profoundly impacted by the COVID-19 pandemic, highlighting significant challenges in OSH management. This research delves into the heightened risks healthcare workers face, mainly focusing on the surge in respiratory infections and needlestick injuries during the pandemic.

Healthcare environments are inherently high-risk due to the exposure to biological hazards and the physical demands of healthcare tasks. The COVID-19 pandemic exacerbated these risks, increasing occupational diseases among healthcare workers [14-16]. This situation underscores the critical need for effective OSH strategies tailored to the healthcare sector, where ergonomics is vital in designing safer work processes and environments.

The research question is as follows: How can OSH practices be optimized in healthcare settings to reduce the incidence of work-related injuries and infections among healthcare workers?

The designed research framework consists of the integration of ergonomic principles with infection control measures to develop comprehensive safety protocols.

The research methodology consists of the following:

- Epidemiological Analysis: Examining the patterns of injuries and infections among healthcare workers during the pandemic.
- Ergonomic Assessments: Conducting ergonomic evaluations to identify risk factors associated with healthcare tasks.
- Intervention Studies: Implementing and assessing the effectiveness of targeted OSH interventions.

The research aims to establish the best practices that effectively reduce the occupational risks healthcare workers face. These practices are expected to be adaptable across various healthcare settings, enhancing overall safety and health outcomes.

The following achievements could be mentioned:

- Development of new guidelines for infection control and ergonomic safety specific to pandemic conditions;
- Successful reduction in the rate of needlestick injuries and respiratory infections through targeted interventions;
- Dissemination of research findings through publications and presentations at international OSH conferences.

2.6 Utilizing Digital Tools for Preventing Work-Related MSDs

Integrating digital tools in occupational safety and ergonomics has revolutionized the approach to preventing work-related MSDs. This research explores the systematic application of various digital solutions that aid in assessment, training, and management of ergonomic risks in the workplace.

Work-related MSDs are a significant concern in OSH due to their prevalence and impact on worker productivity and health. Traditional methods of risk assessment and training are often cumbersome and not timely. Digital tools offer a dynamic and interactive approach, allowing for real-time data collection and analysis, which is crucial in the fast-paced industrial environment.

The research question is as follows: How can digital tools be effectively utilized to prevent MSDs in the workplace?

The research framework consists of the evaluation of the effectiveness of digital tools in enhancing ergonomic interventions and reducing the incidence of MSDs.

Furthermore, the methodology applied consists of:

- Systematic Review: Using the PRISMA method [17] to identify relevant digital tools.
- Functionality Testing: Assessing the tools based on their ergonomic assessment capabilities, ease of use, and integration into workplace systems.
- Outcome Evaluation: Measuring the impact of these tools on reducing MSDs through case studies and empirical data.

The research aims to validate the effectiveness of digital tools in preventing MSDs and to develop guidelines for their implementation in various industrial settings. The goal is to provide a robust framework that can be adapted to different workplace environments to enhance ergonomic safety.

The most important achievements are:

- Identify 31 digital tools that meet the inclusion criteria for effective MSD prevention.
- Development of a comprehensive digital assessment system that incorporates advanced ergonomic evaluation techniques.

2.7 Utilizing AI in OSH

This research explores the potential of A) in preventing occupational diseases and workplace accidents. The focus is on developing AI tools that can operate autonomously or with minimal user intervention, addressing the delicate nature of AI training, which can determine the success or failure of these tools [18].

The challenge in OSH is the selection of appropriate AI tools that can effectively address specific workplace hazards without extensive customization. The research addresses the need for user-friendly yet sophisticated AI solutions that can be readily implemented in diverse industrial settings without the risk of becoming obsolete due to improper training [19].

The research question is as follows: How can AI effectively enhance OSH practices, particularly in preventing workplace accidents and diseases?

The research framework is structured around developing and testing AI models that can be integrated into workplace safety systems.

The research methodology consists of:

- Collection and Categorization: Gathering publicly available and free-to-test software tools, systematically categorizing them, and organizing them into a database.
- Model Development and Testing: Creating and testing various software and hardware solutions, including using the Orange data analysis and visualization program to build models that predict hazardous situations.

The research aims to create a structured database of occupational safety solutions characterized by their main features while remaining user-friendly for users and data

analysis software. This database will help navigate the vast array of available software options, making it easier for safety professionals to find and implement the right tools.

The most relevant achievements are:

- Extensive evaluation of hundreds of occupational safety software tools categorized according to specific criteria.
- Development of an AI model in the Orange program that quantitatively demonstrates the effectiveness of AI in recognizing the approach to dangerous machinery.

2.8 Soft Computing-Based Risk Assessment Procedures in OSH

In today's diverse workplaces, employees from various cultural backgrounds often work together, making it crucial to ensure that safety signals and documentation are universally understood. Misunderstanding safety signs, especially by foreign workers, can lead to severe risks, endangering the individual and their colleagues. For instance, while disposing of waste incorrectly might seem minor, failing to recognize a forklift traffic sign can have serious consequences. Therefore, the clarity and comprehensibility of workplace signs and documentation are paramount in preventing accidents. This research is positioned within the broader field of OSH, focusing on the theoretical background of safety, namely the application of soft computing methods, particularly fuzzy logic, to enhance the understanding and interpretation of safety signals among a multicultural workforce.

The primary research question is: How can soft computing methods, specifically fuzzy logic, improve the recognition and understanding of workplace safety signs among a diverse workforce? The research is structured around the following objectives:

- Understanding Cultural and Communication Barriers: A survey will be conducted to assess how well employees from different cultural backgrounds understand the safety signs that surround them daily. This will highlight gaps in comprehension and guide future improvements in safety systems. Methods:
- Comparative Analysis of Company Practices: Interviews with companies employing multinational workers will be conducted to understand their current practices in communicating safety information. This comparative analysis will identify common shortcomings and areas for improvement.
- Evaluation of Training and Documentation Methods: Existing data will be used to evaluate the effectiveness of pictogram-based training and documentation. This will help develop new models that are easier for all employees to understand, regardless of their cultural background.
- Application of Fuzzy Logic: The fuzzy logic method will be applied to manage uncertainties in safety sign recognition. This involves defining fuzzy sets and rules to help workers recognize signs, even when there is uncertainty in color, shape, or symbol interpretation [20]. The system will be integrated into a digital platform to assist international workers in recognizing safety signs more effectively [21].

The research is expected to develop a more inclusive and effective occupational safety system that reduces misunderstandings and enhances safety for all workers. Specifically, the outcomes include:

- Improved Safety Systems: By addressing cultural and communication barriers, the safety system will be reformed to better meet the needs of a multicultural workforce.
- Enhanced Communication and Training: The findings will inform the creation of new documents and training methods that are easier for all workers to understand, reducing the likelihood of accidents.
- Faster and More Accurate Hazard Recognition: Implementing fuzzy logic is expected to help workers recognize hazards more quickly and accurately, even under uncertain conditions. Our results will contribute to a safer work environment with fewer accidents and better safety compliance.

2.9 Selection, development, and effectiveness assessment of workers' representatives in the field of OSH

The European Union's efforts to create healthy and safe workplaces, eliminate occupational fatalities, reduce work-related illnesses, and address the increasingly complex challenges of Industry 4.0 place significant and responsible demands on OSH professionals. As work equipment becomes more complex, the pace of development accelerates, robotics and AI gain ground, employee turnover remains high, and the number of unfilled positions increases, numerous factors complicate OSH activities. Although laws hold employers responsible for ensuring safe working conditions that do not endanger health, achieving these goals requires the involvement of all three participants in the tripartite OSH system, including the workers' representatives in the field of OSH, who are also entrusted with essential responsibilities [22]. To fulfil their duties, it is not enough for them to be ambitious; they must also be competent. This principle was famously echoed by Lyard, a British MP during the Industrial Revolution, who adopted the now-common slogan, "the right person in the right place" as his motto. Identifying the fundamental and distinctive competencies and components required for workers' representatives' activities is necessary. Research Questions:

1. Can the fundamental and distinctive competencies and their components be identified for workers' representatives in the field of OSH, like professional requirements?
2. Based on these competency components, can a candidate's suitability be assessed?
3. Which areas of competency development do OSH professionals expect from workers' representatives in the field of OSH?
4. Can an effectiveness assessment for workers' representatives in the field of OSH be developed based on their competencies and components?
5. What qualifications do OSH professionals expect from workers' representatives in the field of OSH?

There has been conducted a systematic literature review to explore the competencies of workers' representatives in the OSH field and define the concepts of fundamental and distinctive competencies [23].

Semi-structured interviews will be conducted using a qualitative research method involving OSH professionals. Through text analysis, the components of distinctive competencies will be identified, and soft skills will be defined.

Using a focus group of OSH professionals, employ qualitative and quantitative questionnaire-based research methods to compile workplace skills such as the elements of occupational safety knowledge as a competency, hard skills, and specific expertise as components of competency.

Verify the identified skills through a quantitative research method involving OSH professionals. The results will be processed using SPSS software.

Determining the expected qualification levels for workers' representatives in the field of OSH as anticipated by professionals, using a qualitative research method and semi-structured interviews with participants selected through the snowball sampling method [24].

A case study involving a company's OSH professionals, workers' representatives in the field of OSH, employees, and the employer.

The most relevant expected outcomes are:

- Preliminary assessment of suitability: Using personality tests along with an evaluation of OSH knowledge and professional expertise, it will be possible to preliminarily assess the suitability and aptitude of candidates for the role of workers' representatives in the field of OSH.
- Support for educational and training systems: The identified competencies and their components will provide valuable guidance to the stakeholders in the tripartite system (employers, employees, and government) for developing the necessary educational and training programs tailored to the needs of workers' representatives.
- Effectiveness measurement of training programs: Effectiveness assessment methods can measure and evaluate the impact of educational and training programs on workers' representatives. Based on the

results, further training and development programs can be organized, ensuring continuous improvement in workers' representatives' competencies.

2.10 Enhancing occupational health and safety through key performance indicators

Integrating Key Performance Indicators (KPIs) into OSH practices quantifies safety performance and effectiveness. This research explores the application of KPIs in monitoring and improving safety standards within organizational settings [25]. Work-related injuries and illnesses pose significant challenges to occupational health and safety management. The complexity of modern workplaces requires robust mechanisms to monitor, report, and enhance safety measures effectively [26].

The primary research question is: How can KPIs effectively enhance occupational health and safety management in diverse organizational environments? The study employs a qualitative research methodology involving expert interviews and case studies to gather insights into the implementation and impact of KPIs on OSH practices.

The research anticipates demonstrating that well-designed KPIs contribute to proactive workplace safety management, reducing incidents and enhancing employee well-being. It also expects to highlight the critical role of ergonomic considerations in formulating these indicators.

The study identifies several key achievements:

- Development of KPIs tailored to various organizational needs and safety objectives.
- Implementing these KPIs in a multi-national corporation leads to a measurable decrease in workplace incidents.
- Enhanced awareness and proactive behavior among employees regarding safety practices.

2.11 Organizational Resilience and OSH

Organizational resilience is crucial in managing total institutions, especially in correctional services, where adapting and recovering from challenges is essential for maintaining safety and operational effectiveness [27, 28]. This research explores the multifaceted approach to resilience in high-stress environments, emphasizing the need for a holistic review and enhancement of resilience factors.

Correctional facilities face operational challenges that require a resilient framework to manage effectively. These challenges include managing high-risk populations, ensuring the safety of staff and inmates, and maintaining operational continuity in crises. In terms of OSH, the focus is on creating environments that minimize risk and enhance the well-being of both staff and inmates, thereby fostering a safer and more adaptive operational setting.

Research Question: How can organizational resilience be systematically enhanced in correctional services to improve safety and operational effectiveness?

This study utilizes a comprehensive approach that integrates human resources, technological support, economic resources, procedural justice, continuous organizational learning and adaptability. The methodology includes:

- A systematic review of existing literature on organizational resilience within correctional settings.
- Qualitative and quantitative analyses through surveys and interviews with correctional staff and administration.
- Case studies from various correctional facilities to identify effective resilience practices.

The research aims to develop a resilience enhancement model designed explicitly for correctional services. This model will outline strategies for integrating resilience into daily operations and crisis management, ultimately improving safety and efficiency. Achievements:

- Development of a resilience assessment framework tailored for correctional environments.
- Implement pilot programs that demonstrate the effectiveness of resilience strategies in real-world correctional settings.
- Contributions to academic and professional discussions on enhancing resilience in high-stress occupations through publications and conference presentations [29].

3. CONCLUSION

By addressing foundational and cutting-edge topics, the laboratory contributes to academic knowledge and significantly enhances everyday success in practical safety applications. The integration of high-level research, participation in international projects, and the development of new safety protocols ensure that the outcomes are both relevant and impactful, equipping professionals with tools and methods for safety management. The success of the research is greatly enhanced by various international collaborations and projects, among which the work of the Ergonomics and Human Factors CEEPUS network stands out. [30]

A key area of future research is developing a guide for ergonomic processes in safety management standards, supported by collaborations with institutions specializing in economics and management systems, as well as international societies and standardization bodies. We plan to work with Canadian experts familiar with the CSA Z1004 standard on Workplace Ergonomics [31] and colleagues from the University of Timisoara, India, and Australia.

In response to the new EU Machinery Regulation (Regulation (EU) 2023/1230), [32] we will contribute to the revision of several machinery safety standards. Our collaboration with Beograd Technical University, the European and national standardization bodies, and the Federation of European Ergonomic Societies will be crucial.

International collaboration is essential. Through the Ergonomics and Human Factors CEEPUS network, we will continue research exchanges that enhance our expertise. We contribute to the activity of the International Ergonomics Association (IEA) and the European Agency for Safety and Health at Work (EU-OSHA).

Our partners from various European countries are working on educational and application projects to improve safety competencies and work system performance. We are developing training programs for female supervisors with safety responsibilities and webinars to enhance safety competencies among professionals and the public.

The research at Óbudai University's OSH laboratory advances our understanding of occupational safety and health. We are grateful for the support and look forward to continuing this important work for future generations.

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Studii de ergonomie și securitatea muncii la laboratorul de securitate și sănătate muncii al Universității Óbuda. O sinteză a principalelor realizări

Acest articol prezintă o cercetare cuprinzătoare privind practicile de sănătate și securitate ocupațională (SSO) din Ungaria, concentrându-se pe progresele în ergonomie, măsurarea performanței, cultura securității și prevenirea riscurilor. Se explorează integrarea inteligenței artificiale și a instrumentelor digitale pentru îmbunătățirea securității la locul de muncă și prevenirea accidentelor. Studiul acoperă diverse industrii, inclusiv sectorul sănătății, producției și serviciile corecționale, oferind soluții practice pentru creșterea angajamentului conducerii față de standardele SSO. Prin promovarea networking-ului și reunirea diverselor capacități, lucrarea își propune să contribuie la dezvoltarea unor practici solide de SSO și să îmbunătățească bunăstarea la locul de muncă.

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